

Unit**01**

INTRODUCTION TO BIOLOGY

Q1. What is Science?

Ans. Science is the study in which observations are made, experiments are done and logical conclusions are drawn in order to understand the principles of nature.

Q2. Why the scientific knowledge was classified into different branches?

Ans. In ancient times, all the scientific informations were included under one head i.e. 'Science'. With the passage of time scientific informations increased many folds and this enormous scientific knowledge was then classified into different branches like, biology, physics, chemistry, mathematics etc.

Q3. What Dr. Abdul Salam told about scientific knowledge?

Ans. According to Dr. Abdul Salam, scientific knowledge is the common heritage of mankind.

Q4. What is biology? Describe major divisions of biology.

Ans. Biology

The scientific study of life is called biology.

Explanation of word "Biology"

The word "biology" has been derived from two Greek words:-

- (a) "Bios" meaning 'life'.
- (b) "Logos" meaning 'thought or reasoning'.

What we study in biology?

The study of biology helps us in studying the structures, functions and related aspects of living organisms. It also provides information and remedies to human problems regarding health, food, environment etc.

Major Divisions of Biology

Biology can be divided into three major divisions:-

(i) Zoology

This division of biology deals with the study of animals.

(ii) Botany

This division of biology deals with the study of plants.

(iii) Microbiology

This division of biology deals with the study of microorganisms. e.g. viruses, bacteria, etc.

Q5. Define different branches of biology.

Ans. In order to study all the aspects of life, major divisions of biology are further divided into different branches as defined below:

(i) Morphology

This branch deals with the study of form and structure of living organisms.

(ii) Anatomy:

The study of internal structures is called anatomy.

(iii) Histology

The microscopic study of tissues is called histology.

(iv) Cell biology

The study of structures and functions of cells and cell organelles is called cell biology. This branch also deals with the study of cell division.

(v) Physiology

This branch deals with the study of the functions of different parts of living organisms.

(vi) Embryology

It is the study of the development of an embryo to a new individual.

(vii) Taxonomy

It is the study of the naming and classification of organisms into groups and subgroups.

(viii) Genetics

The study of genes and their role in inheritance is called genetics.

Inheritance means the transmission of characters from one generation to the other.

(ix) Palaeontology

It is the study of fossils, which are the remains of extinct organisms.

(x) Environmental Biology

It deals with the study of the interactions between the organisms and their environment.

(xi) Biotechnology

It deals with the practical application of living organisms to make substances for the welfare of mankind.

(xii) Socio-Biology

This branch deals with the study of social behaviour of animals that make societies.

(xiii) Parasitology

This branch deals with the study of parasites.

(xiv) Immunology

It is the study of immune system of animals, which defends the body against invading microbes.

(xv) Entomology

It is the study of insects.

(xvi) Pharmacology

It is the study of drugs and their effects on the systems of human body.

(xvii) Molecular Biology

It deals with the study of molecules of life; e.g. water, proteins, carbohydrates, lipids and nucleic acids. OR It deals with the structure of organisms, the cells and their organelles at molecular level.

Q6. What are Parasites?

Ans. Parasites are the organisms that take food and shelter from living hosts and in return, harm them. e.g., viruses, bacteria and parasitic worms.

Q7. What are the major biological issues today?

Ans. Human population growth, infectious diseases, addictive drugs and the pollution are the major biological issues today.

Q8. Describe the relationship of biology to other sciences.
Ans. Introduction

The interrelationship among different branches of science cannot be denied. Biological informations relate to the other branches of science as well. For example, when studying the process of movement in animals, the biologists have to refer to the laws of motion in Physics. This forms the basis of interdisciplinary sciences.

(1) Bio-physics

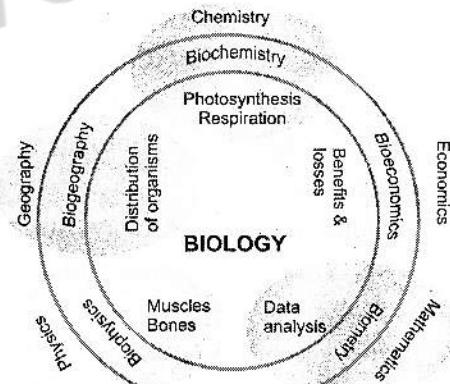
It deals with the study of the principles of physics, which are applicable to the biological phenomena.

Example Similarity between the working principles of lever in Physics and limbs of animals in Biology.

(ii) Bio-chemistry

It deals with the study of the Chemistry of different chemical compounds and processes occurring in living organisms.

Example The study of basic metabolism of photosynthesis and respiration involves the knowledge of Chemistry.



■ Figure 1.1: Relationship of biology with other sciences

(iii) Bio-mathematics / Biometry.

It deals with the study of using mathematical techniques and tools in biological work.

Example

To analyze the data gathered after experimental work, biologists have to apply the rules of mathematics.

(iv) Bio-geography

It deals with the study of occurrence and distribution of different species of living organisms in different geographical regions of the world.

Application of Biogeography

It applies the knowledge of the characteristics of particular geographical regions to determine the characteristics of living organisms found there.

(v) Bio-Economics

It deals with the study of organisms from economical point of view.

Example

The cost value and profit value of wheat can be calculated through this branch and benefits or losses can be determined.

Q9. Briefly describe the careers in biology.

Ans. The following are the careers that a student of biology can plan to adopt.

(i) Medicine / Surgery

(a) Medicine deals with diagnosis and treatment of diseases in human.

(b) In Surgery, the parts of body may be repaired, replaced or removed.

For example, the removal of stones through renal surgery, transplantation of kidney, liver etc.

(c) Both these professions are studied in the same basic course (MBBS) after higher secondary education and the students go for specializations.

(ii) Fisheries

(a) It deals with the study of fish production and enhancing the quality and quantity of fish production.

(b) Professionals of fisheries are employed in fisheries departments of Pakistan.

(c) This profession can be adopted after the bachelor or masters level study of zoology and fisheries.

(iii) Agriculture

(a) It deals with the study of food crops and animals which are the source of food.

(b) An agriculturist works for the betterment of crops like wheat, rice, corn etc and animals.

(c) This professional course can be adopted after the higher secondary education in biology.

(iv) Animal Husbandry

- (a) It is the branch of agriculture concerned with the care and breeding of domestic animals (livestock) e.g. cattle, sheep etc.
- (b) This professional course can be adopted after the higher secondary education in biology.

(v) Horticulture

- (a) It deals with the study of art of gardening.
- (b) A horticulturist works for the betterment of existing varieties and for the production of new varieties of ornamental plants and fruit plants.
- (c) This professional course can be adopted after the higher secondary education in biology.

(vi) Farming

- (a) It deals with the development and maintenance of different types of farm.
For example, in some farms, animal breeding technologies are used for the production of animals which are better protein and milk source.
- (b) In poultry farms, chicken and eggs are produced.
- (c) In fruit farms, different fruit yielding plants are grown.
This profession can be adopted after the course of agriculture, animal husbandry or fisheries.

(vii) Forestry

- (a) It deals with the study of natural forests and advises to the government for planting and growing artificial forests.
- (b) This professional course can be adopted after the higher secondary education in biology or after bachelor level study of zoology and botany.

(viii) Biotechnology

- (a) It deals with the study and work for the production of useful products through microorganisms.
- (b) This professional course can be adopted after the higher secondary education in biology or after bachelor level studies of zoology or botany.

Q10. Explain the Islamic concept about origin of life. (Lahore board 2011 G I) (short question)

Ans. Allah hints about the origin and characteristics of living organisms at many places in the Holy Quran. Human beings have been instructed to expose the unknown aspects of life after getting the hints from the verses.

Verse No. 1
Creation of life from water

وَجَعَلْنَا مِنَ الْمَاءِ كُلَّ شَيْءٍ بِحَيٍّ

“We made everything from water.” (Sura: Ambia, Verse: 30)

The above verse hints at the common origin of all living things in water and water makes 60-70% of the composition of protoplasm of all living things.

Verse No. 2
Creation of Life from Clay & Method of Development

خَلَقَ الرُّسَّانَ مِنْ صَلْصَالٍ كَانَ فَخَارٌ

“He made man from clay like the potter.” (Sura: Rehman, Verse: 14)

Verse No.3

In another verse, God says:

ثُمَّ خَلَقْنَا النُّطْفَةَ عَلَقَةً فَخَلَقْنَا الْعَلَقَةَ مُضْعَةً
فَخَلَقْنَا الْمُضْعَةَ عَظِيمًا فَكَسَوْنَا الْعَظِيمَ لَهُمَا

“Then fashioned we the drop a clot, then fashioned we the clot a little lump, then fashioned we the little lump bones, then clotted the bones with flesh.” (Sura: Al-Mominoon, Verse: 14)

In both above verses, we find the events that occurred in the creation of human beings and Allah also hints at the method of the development of animals including human beings.

Verse No. 4
Concepts of Classification

وَاللَّهُ خَلَقَ كُلَّ دَابَّةٍ مِّنْ مَاءٍ فَيُنَهِّمُهُمْ مَنْ يَشَاءُ عَلَى بَطْنِهِ وَمَنْهُمْ مَنْ يَنْهَا عَلَى رِجْلَيْهِ
وَمَنْهُمْ مَنْ يَنْهَا عَلَى أَرْبَعٍ يَخْلُقُ اللَّهُ مَا يَشَاءُ إِنَّ اللَّهَ عَلَى كُلِّ شَيْءٍ قَدِيرٌ

“Allah hath created every animal from water, then some of them creep up over their bellies, others walk on two legs and others on four. Allah creates what He pleases.”

(Sura: Al-Nur, Verse: 45)

This verse describes the common origin and modification of organisms and also supports the modern concepts of classification.

Q11. Describe the contributions of different Muslim scientists in the field of Biology.

Ans. Muslim scientists have made great contributions to the science and we are aware of their success in different fields of science.

(i) Jabir Bin Hayan (721-815 AD) (Lahore board 2012 G I)

(a) He was born in Iran and practiced medicine in Iraq.



(Jabir Bin Hayan)

(b) He introduced experimental investigations in chemistry and also wrote a number of books on plants and animals.

(c) His famous books are "Al-Nabat" and "Al-Haywan".

(ii) **Abdul Malik Asmai (740-828 AD)** (Lahore board 2012 G II)

❖ He is considered the first Muslim scientist who studied animals in detail.

❖ His famous writings include "Al-Abil (camel)", "Al-Khail (horse)", "Al-Wahoosh (animal)" and "Khalqal-ansan"

(d) **Bu Ali Sina (980-1037 AD)** (Lahore board 2011 G II)

❖ He is honoured as the founder of medicine and called as Avicenna in the west.

❖ He was a physician, philosopher, astronomer and poet.

❖ One of his best books "Al-Qanun fial-Tib" is known as the canon of medicine in west.



Photograph of Bu Ali Sina commemorated on a ticket in Poland

Q12. Describe separate and comparative description of all the levels of biological organization.

Ans. Biological organization at different levels

(1) Subatomic and Atomic level

(a) Atoms and Elements

❖ All types of matter are made up of elements.

❖ There are about 92 kinds of elements found in nature.

❖ Each element is made up of a single kind of atoms ('a': not, 'tom': cut).

❖ These atoms are actually the structures formed by many subatomic particles.

❖ The most stable subatomic particles are electrons, protons and neutrons.

(b) Bioelements

❖ Out of the 92 elements, 16 elements take part in making the body mass of a living organism called bioelements.

❖ Only six (O, C, H, N, Ca & P) make 99% of total mass. These are known as major elements.

❖ Other ten (K, S, Cl, Na, Mg, Fe, Cu, Mn, Zn & I) collectively make 1% of the total mass. These are called trace elements.

(i) Oxygen = 65% (ii) Carbon = 18% (iii) Hydrogen = 10%

(iv) Nitrogen = 3% (v) Calcium = 2% (vi) Phosphorous = 1%

(vii) Others = 1%

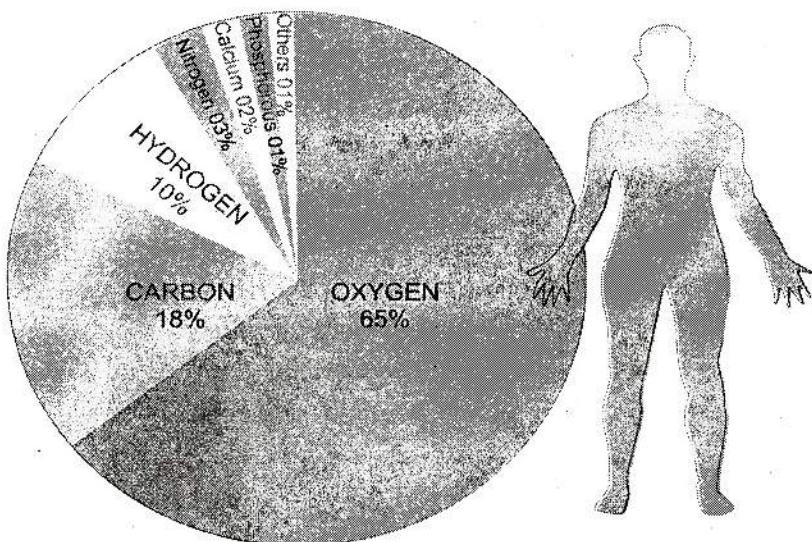


Figure 1.2: Percentage composition (by mass) of bioelements in the protoplasm of living organisms

(2) Molecular Level

(a) Biomolecules

- ❖ In organisms, bioelements usually do not occur in isolated forms rather they combine through ionic or covalent bonding.
- ❖ The stable particle formed by such bonding is called as molecule, if occurring in the bodies of living organisms they are called biomolecules.
- ❖ An organism is formed by enormous number of biomolecules of hundreds of different types.
- ❖ These molecules are the building material and are themselves constructed in great variety and complexity due to specific bonding arrangements.

Classification of Biomolecules

- ❖ Biomolecules may be classified as:

a) Micromolecules

These are molecules with low molecular weight e.g. glucose, water etc.

b) Macromolecules

These are molecules with high molecular weight e.g. starch, proteins, lipids etc.

(3) Organelle and Cell Level (Lahore board 2011 G I) (short question)

(a) Organelle Formation

- ❖ Biomolecules assemble in a particular way and form organelles.

(b) Cell Formation

- ❖ The organelles are actually sub-cellular structures and when they assemble together, cells are formed.

(c) Division of Labour within the Cell

- ❖ Each type of organelle is specialized to perform a specific function e.g. mitochondria are specialized for cellular respiration and ribosomes are specialized for protein synthesis. In this way, functions of the cell are accomplished by these specialized structures. It is an example of the division of labour within the cell.

No. of Cells

- ❖ In the case of Prokaryotes and most protists, the entire organism consists of a single cell.
- ❖ In the case of most fungi, all animals and plants, the organism consists of upto trillions of cells.

(4) Tissue Level

(a) Definition

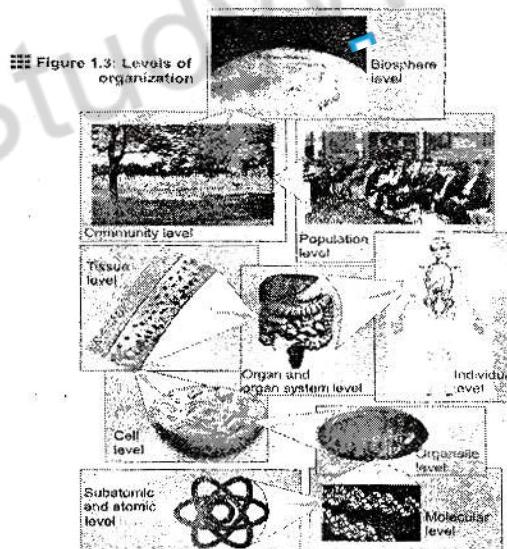
- ❖ A group of similar cells specialized for the performance of a common function.

(b) Explanation

- ❖ Each cell in a tissue carries on its own life processes (e.g. cellular respiration, protein synthesis) and also some special processes related to the function of the tissue.

(c) Examples

- ❖ There are different types of plant tissues, e.g. epidermal tissue, ground tissue etc. Animal tissues are also of different types e.g. nervous tissues, muscular tissues etc.



(5) Organ and Organ System Level

Organ Level

(a) Formation of Organ Level

- ❖ More than one type of tissue having related functions are organized together to form organ.

- ❖ Different tissue of an organ perform their specific functions and these functions collectively become the functions of that organ.

(b) Example

- ❖ For example, stomach is an organ specialized for the digestion of proteins & storing food.
- ❖ Stomach have:-
 - (i) Epithelial (glandular) tissues which secrete the gastric juice.
 - (ii) Muscular tissues perform contractions of stomach walls for grinding of food, mixing enzyme with food and moving food to posterior end. So two tissues perform their functions which collectively become the function of stomach.
 - (iii) Connective tissue which help to connect other tissues together
 - (iv) Nervous Tissue: The action of stomach is co-ordinated by this tissue.

Organ System Level**(a) Formation of Organ System Level**

- ❖ Different organs performing related functions are organized together in the form of an organ system.
- ❖ In organ system, each organ carries out its specific function and the functions of all organs appear as the function of the organ system.

(b) Example

Digestive system carries out process of digestion. It consists of oral cavity, stomach, small intestine, large intestine, liver and pancreas.

- ❖ The organ system level is less definite in plants as compared to animals.

(6) Individual Level**(a) Formation of Individual Level**

- ❖ Different organs and organ systems are organized together to form an individual (organism).
- ❖ In an organism, various organs and organ systems are organized in such a way that all the functions, processes and activities are coordinated.

(b) Example

- ❖ During continuous and hard exercise, rate of respiration and heart beat are increased and supplies more oxygen and food to muscles which is needed for continuous work.

(7) Population Level**(a) Formation of Population Level**

- ❖ A group of organisms of same species located at the same place, in the same time is called population.

(b) Example

Human population in Pakistan in 2010 comprises of 173.5 million individuals.

(8) Community Level**(a) Introduction**

A community is an assemblage of different populations interacting with one another within the same environment.

(b) Example

- ❖ A forest may be considered as a community. It includes different plants, microorganisms, fungi and animal species.
- ❖ Communities are collections of organisms, in which one population may increase and others may decrease.
- ❖ Some communities are complex e.g. forest and pond community.
- ❖ Some communities are simple e.g. a fallen log with various populations under it.
- ❖ Simple communities have limited number and size and any change in biotic or abiotic factors may have drastic and long lasting effects.

(9) Biosphere Level

The part of the earth inhabited by organisms' communities is known as biosphere. It constitutes all ecosystems (area where living organisms interact with non-living components of the environment) and is also zone of life on earth.

Q13. Give comparison in cellular, colonial and multicellular organization.**Ans. Five Major Groups of Organisms**

All organisms have been divided into five major groups i.e. prokaryotes, protists, fungi, plants and animals.

Types of Cells

All organisms are made of cell.

There are two basic types of cells.

Prokaryotic Cells:

Cells lacking membrane bounded nucleus and organelles are called prokaryotic cells e.g. bacteria & cyanobacteria.

Eukaryotic Cells:

Cells having membrane bounded nucleus and organelles are called eukaryotic cells e.g. animal cells, plant cells etc.

Cell Organization:

In the living organisms, the cells organize in three ways to make bodies of organisms. Cells make unicellular, colonial and multicellular organizations and the organisms formed through these organizations are unicellular organisms, colonial organisms and multicellular organisms respectively.

a) Unicellular organization:

(Lahore board 2012 G II)

- ❖ In unicellular organisms, only one cell makes the life of an organism.
- ❖ All the life activities are carried out by the only cell.

- ❖ Examples: Amoeba, Paramecium, Euglena etc.

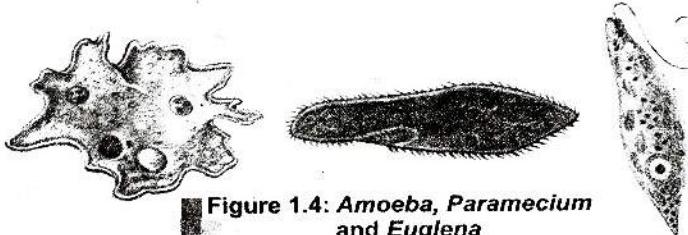


Figure 1.4: Amoeba, Paramecium and Euglena

b) Colonial Organization:

- ❖ In colonial type of cellular organization, many unicellular organisms live together but do not have any division of labour among them.
- ❖ Each unicellular organism in a colony lives its own life and does not depend on other cells for its vital requirements.
- ❖ Volvox is a green alga found in water is an example of colonial organization.
- ❖ Hundreds of volvox cells make a colony.

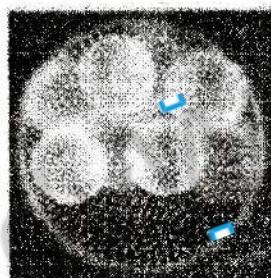


Figure 1.5 volvox colony

c) Multicellular Organization:

In multicellular organization, cells are organized in tissues, organs and organ systems.

Examples

Mustard Plant: *Brassica Campestris*:

(a) Sowing

- ❖ It is sown in winter and produces seed at the end of winter.

(b) Importance

- ❖ Its plant body is used as vegetable & its seeds are used for extracting oil.

(c) Body Parts

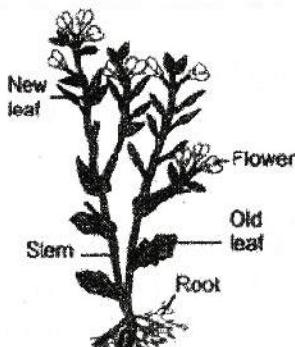
- ❖ Plant body consists of two parts:-

a) Vegetative Parts:

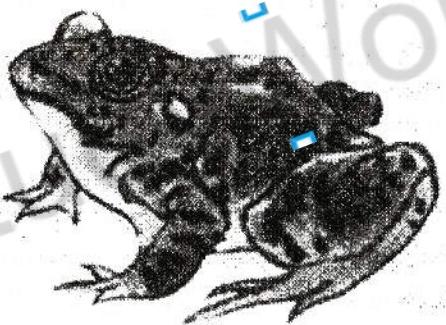
- ❖ It includes roots, stems, branches and leaves.
- ❖ These do not take part in sexual reproduction.

b) Reproductive Parts:

- ❖ Flowers are reproductive parts of plant because they take part in sexual reproduction and produce fruits and seeds.

**Figure 1.6: Mustard****Frog: Rana tigrina:****(a) Body**

- ❖ The body of frog also shows multicellular organization.
- ❖ The body is made up of organ systems.
- ❖ Each organ system consists of related organs
- ❖ All the organs are made of specific tissues (epithelial, glandular, muscular, nervous etc.)

**Figure 1.7 Frog****Q.14: What do you know about species?**

Ans. A species is defined as a group of organisms capable of interbreeding and producing fertile offspring.

Q.15: What is habitat?

Ans. Habitat means the area of the environment in which organism lives.

Multiple Choice Questions

1. Members of the same species living in the same place at the same time make a;
(a) Habitat (b) Biosphere
(c) Community (d) Population

2. If a scientist is studying the methods of inserting human insulin gene in bacteria, which branch of biology may this be?
(a) Anatomy (b) Physiology
(c) Biotechnology (d) Pharmacology

3. Which one will be the correct sequence of the levels of organization of life?
(a) Cell, organelle, molecule, organ, tissue, organ system, individual
(b) Molecule, tissue, organelle, cell, organ system, organ, individual
(c) Molecule, organelle, cell, tissue, organ, organ system, individual
(d) Organ system, organ, tissue, cell, molecule, organelle, individual

4. Which of these major bioelements is the highest percentage in protoplasm?
(a) Carbon (b) Hydrogen
(c) Oxygen (d) Nitrogen

5. Which of the following group include organisms all of which are absorptive in their nutrition?
(a) Protists (b) Animals
(c) Bacteria (d) Fungi

6. Similar cells organized into groups and performing same functions, are known as:
(a) Organelle (b) Tissue

7. Which of these tissues also makes the glandular tissue in animals?
(a) Epithelial tissue (b) Muscular tissue
(c) Connective tissue (d) Nervous tissue

8. The level of organization that is less definite in plants is:
(a) Tissue level (b) Organ level
(c) Organ system level
(d) Individual level

9. What is true about volvox?
(a) Unicellular prokaryote
(b) Unicellular eukaryote
(c) Colonial eukaryote
(d) Multicellular eukaryote

10. When we study the feeding relations among different animal species of a forest, at what level of organization we are studying?
(a) Individual (b) Population
(c) Community (d) Biosphere

11. _____ knowledge is the common heritage of mankind.
(a) Scientific (b) Islamic
(c) Biological (d) None of these

12. The example of colonial organism is:-
(a) Amoeba (b) Volvox
(c) Frog (d) Mustard plant

13. The example of micromolecule:-
(a) Starch (b) Protein
(c) Fats (d) Water

14. Microscopic study of tissues is called:-
(a) Physiology (b) Morphology
(c) Histology (d) Anatomy

- 15.** Which one is major biological issues today?
 (a) Infectious diseases
 (b) Addictive drugs
 (c) Environmental pollution
 (d) All of these
- 16.** Organisms of a species living in a particular habitat at a particular time:
 (a) Population (b) Community
 (c) Individual (d) None of these
- 17.** Study of insects is called:
 (a) Immunology (b) Entomology
 (c) Genetics (d) Ecology
- 18.** Water makes _____ of the composition of protoplasm of all living things.
 (a) 60% (b) 70%
 (c) 50-60% (d) 60-70%
- 19.** The number of bioelements is:
 (a) 92 (b) 6 (c) 16 (d) 10
- 20.** How much nitrogen is present in making body mass of a living organism?
 (a) 10% (b) 3%
 (c) 1% (d) 18%
- 21.** Which of the following are supporting tissues in animals?
 (a) Nervous (b) Epithelial
 (c) Muscular (d) Connective
- 22.** The author of "Al-Qanun-fial-Tib" is:
 (a) Jabir Bin Hayan
 (b) Abdul Malik Asmai
 (c) Bu Ali Sina (d) None
- 23.** Which of the following is not unicellular organism?
 (a) Amoeba (b) Paramecium
- 24.** Which one are not vegetative organs?
 (a) Roots (b) Stems
 (c) Leaves (d) Flowers
- 25.** Scientific name of frog is:
 (a) Rana tigrina
 (b) Rosa indica
 (c) Rana Tagrina
 (d) Brassica Campestris
- 26.** Forest community is an example of _____ community.
 (a) Simple (b) Complex
 (c) Coordinated (d) None
- 27.** The study of internal structure is called:
 (a) Anatomy (b) Histology
 (c) Entomology (d) Taxonomy
- 28.** As a bioelement, the percentage of carbon is:
 (a) 18% (b) 10%
 (c) 2% (d) 3%
- 29.** Biology is a word of which language?
 (a) Latin (b) Arabic
 (c) Greek (d) English
- 30.** The reproductive part of plant is:
 (a) Stem (b) Leaves
 (c) Root (d) Flower
- 31.** Stomach is an example of:
 (a) Tissue level
 (b) Organ level
 (c) Organ system level
 (d) None

Answers													
1.	d	6.	B	11.	a	16.	a	21.	d	26.	b	31.	b
2.	c	7.	A	12.	b	17.	b	22.	c	27.	a		
3.	c	8.	C	13.	d	18.	d	23.	c	28.	a		
4.	c	9.	C	14.	c	19.	c	24.	d	29.	c		
5.	d	10.	c	15.	d	20.	b	25.	a	30.	d		

Short Questions

Q.1. What do you know about agriculture?

Ans. It deals with the study of food crops and animals which are the source of food. An agriculturist works for the betterment of crops like wheat, rice, corn etc and animals. This professional course can be adopted after the higher secondary education in biology.

Q.2. Define anatomy.

Ans. The branch of biology which deals with the study of internal structure of the organisms is called internal morphology or anatomy.

Q.3. What is animal husbandry?

Ans. It deals with the study of care and breeding of livestock.

Livestock includes all the domestic animals like cattle, sheep etc.

This professional course can be adopted after the higher secondary education in biology.

Q.4. Define molecular biology or biochemistry. (Lahore board 2012 G II)

Ans. The branch of biology which deals with the study of the molecules of life. e.g. water, proteins, carbohydrates, lipids and nucleic acids is called molecular biology. The study of biochemical reactions occurring in living organisms is also included in this branch.

Q.5. What do you know about bioeconomics?

Ans. The study of organisms from economical point of view. It includes the study of cost effectiveness and viability of biological projects e.g. the cost value and profit value of wheat can be calculated through this branch and benefits or losses can be determined.

Q.6. What are bioelements?

Ans. The elements which take part in making the body mass of a living organism are called bioelements. These are 16 in number. There are two types of bioelements.

(i) Major elements: Six elements making 99% mass of living organisms are called major elements. These are C, H, O, Ca, N and P.

(ii) Trace elements: Other ten elements making 1% mass of living organisms are called trace elements. These are K, S, Cl, Na, Mg, Fe, Cu, Mn, Zn & I.

Q.7. Define biogeography.

Ans. The study of occurrence and distribution of different species of animals and plants in different geographical regions of the world is called biogeography.

Q.8. Define biology.

Ans. The scientific study of living things is called biology. The word “biology” is derived from two Greek words:

- (a) “Bios” meaning ‘life’. (b) “Logos” meaning ‘thought or reasoning’.

Biology has three major divisions:

- i. **Botany:** The scientific study of plants is called botany
- ii. **Zoology:** The scientific study of animals is called zoology
- iii. **Microbiology:** The scientific study of microorganisms is called microbiology.

Q.9. What do you know about biomathematics?

Ans. The study of practical and theoretical applications of mathematical techniques and tools in biological processes and research is called biomathematics e.g. To analyze the data gathered after experimental work.

Q.10. What do you mean by biomolecules?

Ans. Atoms of different bioelements combine through ionic or covalent bonding to form stable particles called biomolecules or molecules of life.

An organism is formed by enormous number of biomolecules of hundreds of different types e.g. glucose, amino acids, fatty acids, starch, proteins, lipids etc.

Q.11. Define biophysics. (Lahore board 2012 G II)

Ans. It deals with the study of the principles of physics, which are applicable to the biological phenomena. e.g. similarity between the working principles of lever in Physics and limbs of animals in Biology.

Q.12. What is biotechnology?

Ans. The branch of biology which deals with the practical application of the knowledge about microorganisms to carry out processes, which make substances for the welfare of mankind.

Q.13. Define botany.

Ans. The branch of biology which deals with the study of plants is called botany. e.g. mustard, rose.

Q.14. What is cell?

Ans. Cell is the basic unit of structure and function of living organisms. Different organelles assemble together to form the simplest living unit i.e. the cell. It may be prokaryotic cell i.e. without distinct nucleus and eukaryotic cell i.e. with distinct nucleus.

Q.15. Define Cell biology.

Ans. The branch of biology which deals with the study of structures and functions of cells and cell organelles is called cell biology. This branch also deals with the process of cell division.

Q.16. What do you mean by colony? Give example.

Ans. When many unicellular organisms live together and each of them lives its own life and does not depend on other cells for its vital requirements, it is called a colony. e.g. Volvox is a green colonial alga living in water.

Q.17. What is community? Give example. (Lahore board 2011 G II)

Ans. Different populations interacting with one another and living in the same environment form community.

For example, forest. It includes different plant species (oak trees, ash trees, grasses, bushes) different species of microorganisms, fungi and animals.

Q.18. Define embryology.

Ans. The branch of biology which deals with the study of the development of a new individual from fertilized egg to a new born baby is called embryology. It includes cell growth, differentiation, and morphogenesis (the process that gives rise to tissues and organs).

Q.19. What is entomology?

Ans. The branch of biology which deals with the study of insects. It includes the general characteristics and life cycles of beneficial and harmful insects.

Q.20. What do you mean by environmental biology?

Ans. The branch of biology which deals with the study of the interactions between organisms and their environment is called environmental biology.

Q.21. What do you know about farming?

Ans. It deals with the study of different types of farm, their development and maintenance. For example, in some farms animal breeding technologies are used for the production of animals which are better protein and milk source.

- In poultry farms, chicken and eggs are produced.
- In fruit farms, different fruit yielding plants are grown.

Q.22. What is fisheries?

Ans. It deals with the study of fish production and enhancing the quality and quantity of fish production.

Professionals of fisheries are employed in fisheries departments of Pakistan.

This profession can be adopted after the bachelor or masters level study of zoology and fisheries.

Q.23. What is forestry?

Ans. It deals with the study of natural forests and advises to the government for planting and growing artificial forests. This professional course can be adopted after the higher secondary education in biology or after bachelor level study of zoology and botany.

Q.24. What are fossils?

Ans. Fossils are dead remains of extinct organisms and their impressions preserved in rocks. Study of these fossils is called palaeontology.

Q.25. Define Genetics.

Ans. The branch of biology which deals with the study of the structure and functions of genes and biological inheritance of characters from one generation to the other is called genetics.

Q.26. What do you mean by histology?

Ans. The branch of biology which deals with the microscopic study of tissues is called histology.

Q.27. What do you know about horticulture?

Ans. It deals with the study of art of gardening.

A horticulturist works for the betterment of existing varieties and for the production of new varieties of ornamental plants and fruit plants.

This professional course can be adopted after the higher secondary education in biology.

Q.28. Define Immunology.

Ans. The branch of biology which deals with the study of immune system of animals which defends the body against invading microbes.

Q.29. What is inheritance?

Ans. Inheritance means transmission of characters from one generation to the other.

Q.30. Define macromolecules. Give examples.

Ans. The molecules with high molecular weights are called macromolecules e.g. starch, proteins, lipids etc.

Q.31. Define microbiology.

Ans. The branch of biology which deals with the study of microorganisms is called microbiology e.g. viruses, bacteria, etc.

Q.32. Define micromolecules. Give examples.

Ans. The molecules with low molecular weights are called micromolecules e.g. glucose, amino acids, fatty acids etc.

Q.33. What are microorganisms?

Ans. The organisms which cannot be seen with naked eye. We use microscope in order to see them are called microorganisms e.g. viruses, bacteria, protozoans etc.

Q.34. What is morphology?

Ans. The branch of biology which deals with the structure of living organisms is called morphology. It is of two types. If we study the external structure of the organisms, it is called external morphology. When we study internal structure of the organisms, it is called internal morphology or anatomy.

Q.35. Define organ. Give examples.

Ans. In higher multicellular organisms, particularly in animals, more than one type of tissue having related functions are organized together to form a unit, called organ. For example, stomach is an organ specialized for the digestion of proteins and storing food.

Q.36. What is organ system? Give examples.

Ans. In higher multicellular organisms, particularly in animals, different organs performing related functions are organized together in the form of an organ system. For example, digestive system carries out process of digestion. It consists of oral cavity, stomach, small intestine, large intestine, liver and pancreas.

Q.37. What do you mean by organelles? Give examples.

Ans. An enormous number of biomolecules become associated in a particular way and form organelles. The organelles are actually sub-cellular structures. e.g. mitochondria, ribosomes etc.

Q.38. Define Palaeontology. (Lahore board 2011 G I) (Lahore board 2011 G II)

Ans. The branch of biology which deals with the study of fossils, which are the remains of extinct organisms.

Q.39. What are Parasites?

Ans. Parasites are the organisms that take food and shelter from living hosts and in return, harm them.

Q.40. Define Parasitology. (Lahore board 2011 G I)

Ans. The branch of biology which deals with the study of parasites is called parasitology. The structure, habitats, mode of transmission, life histories and host – parasite relationships are studied in this branch.

Q.41. What do you know about Pharmacology?

Ans. The branch of biology which deals with the study of drugs and their effects on the systems of human body.

Q.42. Define Physiology.

Ans. The branch of biology which deals with the study of the functions of different parts of living organisms is called physiology.

Q.43. Define Population. Give examples.

Ans. A group of organisms of same species located in the same place, at the same time is called population. For example human population in Pakistan in 2010 comprises of 173.5 million individuals.

Q.44. What are Prokaryotes and eukaryotes. Give examples. (Lahore board 2011 G II)

Ans. The organisms which do not have well defined nucleus and membrane bounded organelles in their cells are called prokaryotes. e.g. bacteria and cyanobacteria.

The organisms which have well defined nucleus and membrane bounded organelles in their cells are called eukaryotes. e.g. all animals and plants etc.

Q.45. What do you know about Protista?

Ans. It includes eukaryotic unicellular and simple multicellular organisms. There are three main types of protists.

- (i) Algae (Plant like protists)
- (ii) Protozoans (Animal like protists)
- (iii) Fungi-like protists

Q.46. Define Science.

Ans. Science is the study in which observations are made, experiments are done and logical conclusions are drawn in order to understand the principles of nature.

Q.47. Define Socio-biology.

Ans. The branch of biology which deals with the study of social behaviour and communal life of living organisms.

Q.48. What do you know about Surgery?

Ans. In surgery, parts of body may be repaired, replaced or removed.

For example, removal of stones through Renal surgery, transplantation of kidney, liver etc.

Q.49. Define taxonomy. (Lahore board 2012 G I)

Ans. The branch of biology which deals with the study of scientific naming and the classification of organisms into groups and subgroups is called taxonomy.

Q.50. Define Tissue. Give examples.

Ans. A group of similar cells specialized for the performance of a common function. e.g. Xylem tissue, epithelial tissue.

Q.51. What do you know about Volvox?

Ans. Volvox is a green alga found in water that show colonial organization. Hundreds of volvox cells make a colony.

Q.52. Define Zoology.

Ans. The branch of biology which deals with the study of animals is called zoology.